

XII. On *Cercococcus eremobius*, gen. et sp. nov., an Aberrant Form of Coccidæ.  
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(Plate 34.)

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THE species of Coccid which I have to describe in this paper was found on a desert-plant growing on the hill known as Djebel-el-Melah, "the Mountain of Salt," in one of the southern spurs of the great central plateau of Algeria, where the mountains slope down to the Algerian Sahara, a few miles north of the oasis of Biskra. The hill consists of beds of rock-salt and gypsum overlaid by Cretaceous strata. At this place was growing a specimen of a Cistaceous plant, *Helianthemum kahiricum*, Delile, found throughout the Algerian Sahara, and having a general distribution from Syria to Algeria: for this determination I am indebted to Dr. Stapf, of the Herbarium of the Royal Gardens, Kew. The specimen is a dwarf woody shrub, reaching about four inches from the ground. It bears on its twigs conspicuous white masses of a substance somewhat like cotton-wool in appearance. The small oblong-lanceolate leaves of the plant are, as in so many desert-plants, covered with hairs, which are very minute in this case. These hairs give a greyish colour to the plant, but are not otherwise conspicuous, whereas the wool-like masses are decidedly so, contrasting strongly with the leaves and twigs, as will be seen in Pl. 34. fig. 1, which shows almost the whole plant. The infected plant was collected on Dec. 25, 1906, by Mr. J. J. Lister, who found that each of the wool-like masses contains a Coccid. Not having time to investigate the matter himself, Mr. Lister very kindly handed the material to me for examination.

I owe my best thanks to Mr. Robert Newstead for kindly examining specimens, and for pointing out the salient features and systematic position of the insect; also to Dr. David Sharp for much help and advice in dealing with it. With this assistance it has been possible to make out fairly satisfactorily its characters.

It is necessary to form a new genus of the subfamily *Dactylopiinæ*, closely allied to *Asterolecanium*\*, Signoret. The following is a diagnosis:—

CERCOCOCCUS, gen. nov.

*Fem. adult.* Corpus prolongatum, caudâ distinctâ munitum. Lobi anales magni, setigeri. Antennæ minutæ. Insectum omnino carens pedibus.

Maris puparium nullo modo translucens, extrinsecus filis longis. Mas incognitus.

\* *Astero-Lecanium* (Targ.), Sign. (1868), Ann. Soc. ent. France, 1869, p. 101; *Asterolecanium*, Targ. 1869 [sec. Fernald, Cat. Cocc. p. 49], Sign. (1868), Ann. Soc. ent. France, 1870, p. 276.

*CERCOCOCCUS EREMOBIUS*, sp. nov.

*Fem. adult.* Corpus subrotundum; supra fortiter convexum, ad latera obsolete transversim sulcatum, tribus sericibus longitudinalibus tuberculorum perparum elevatorum, foveis numerosissimis fila albida emittentibus, insectum omnino tegentia; infra convexum. Cauda brevis, depressa.

*Adult female.* It will thus be seen that the most striking characters are the prolongation of the body to form a perfectly distinct tail terminated by large anal lobes, and the presence of very numerous pits scattered over the dorsal surface, from which emerge long curling threads, which together form the dense white covering that entirely conceals the insect and its ovisac. The ovisac, too, is itself a highly remarkable structure.

The body of the insect, considered apart from the tail, has a very rounded and convex appearance. Dorsally there is a steep posterior slope down to the tail, which is depressed and considerably below the general surface. Ventrally, the surface of the tail is continuous with that of the trunk. No traces of asymmetry, such as are exhibited by the adult females of some species of *Lecanium*, are visible. The colour of the specimens preserved in formalin and afterwards transferred to spirit is orange, lighter on the ventral surface. When freshly found they also appeared to be orange, though no close examination was then made. They vary considerably in size; a large specimen measures about  $3\frac{1}{3}$  mm. long by  $2\frac{3}{4}$  mm. broad, while a smaller one was only about  $2\frac{1}{3}$  mm. long. This is no doubt due to differences in the degree of maturity.

The transverse depressions at the sides of the body are somewhat vague. Posteriorly, where the surface of the trunk slopes down to the tail, there are others extending right across the body. The basal portion of the tail also shows a kind of segmentation, which in the distal part becomes, dorsally, very obscure. The tubercles (Pl. 34. fig. 4, *a, a*) of the median and lateral longitudinal rows are only very slightly elevated. They are serially arranged with respect to the transverse furrows, one tubercle standing between each two depressions. They will be mentioned again in connection with the excretory products of the insect. A description of the pits (Pl. 34. fig. 4) scattered so densely over the dorsal surface of the trunk is left till the peculiarities of the integument as a whole are dealt with.

The ventral surface (Pl. 34. fig. 2), with the exception of a few minute setæ only visible under a high power of the microscope, is smooth, lacking the pits so numerous on the dorsal. At either side it has two well-marked longitudinal furrows (Pl. 34. fig. 2 *a, b*), into the inner of which open the spiracles. An inconspicuous transverse furrow leads from the inner to the outer longitudinal furrow, at the point where the posterior spiracle is placed. Just in front of the anterior spiracle, the inner furrow converges with and joins the outer. In front of this point of union the outer furrow curves round towards the middle line, so that it approaches, but does not meet, its fellow of the opposite side of the body.

In this anterior part of the furrow lies the antenna (Pl. 34. figs. 2 *c, 3*), which consists of a single short chitinous piece, round in surface view, bearing a short thick spine and four or more setæ.

The surface of the trunk within the inner furrows is strongly convex, and at the centre of it is the rostrum, sunk in a depression. The loop of the rostral filaments is long. There is no trace of legs or feet, or of eyes.

The spiracles (Pl. 34. fig. 2, *d*), as previously mentioned, open, two on either side of the body, into the inner longitudinal furrows. Like the antennæ, they are more strongly chitinised and darker in colour than the surrounding integument. Each consists of a shallow circular chamber, in the external floor of which is the orifice to the exterior, while an opening in the internal floor leads into a tracheal trunk. In connection with each spiracle is a curiously shaped structure, strongly chitinised, and very conspicuous in specimens that have been emptied of their soft parts by treatment with caustic potash. This structure is adjacent to the side of the stigmatic chamber remote from the lateral margin of the body, and extends forwards and slightly towards the middle line. In transverse sections it appears as a ridge projecting from the cuticle into the interior of the body, and muscles extending from the dorsal surface are attached to it at one point. On the side of the stigmatic chamber nearer the lateral margin of the body is a group of cutaneous glands, which will be spoken of later.

The ventral surface of the posterior part of the trunk and of the tail shows very distinct division into eight segments (Pl. 34. fig. 2). The anal orifice is surrounded by eight setæ (Pl. 34. fig. 9) rising from a slender chitinous ring, which has a beaded appearance. Just anterior to this anal ring rise a large and a small pair of setæ in close proximity to each other (Pl. 34. fig. 9), and the integument of the terminal segment in this region bears a number of very minute projections (Pl. 34. fig. 9, *a*). Between the anal lobes is a shorter median lobe (Pl. 34. fig. 9, *b*), dorsal to the anus. Each anal lobe (Pl. 34. fig. 9, *c*) is large; it bears a long seta at its extremity, and five smaller ones (the arrangement of which is shown in the figure) on its more proximal portions. Every seta rises from a chitinised base, having the form of a cup with a raised and thickened rim. The genital aperture is a somewhat transverse opening in the ventral middle line, in the region of the furrow between the sixth and seventh segments; the integument immediately surrounding it shows extremely fine striæ radiating from it (Pl. 34. fig. 9, *d*).

Passing now to a consideration of the integument and the excretory products of the insect, the most striking feature of all is the very numerous threads secreted by cutaneous glands on the dorsal surface. These form a dense covering completely concealing not only the body of the female, but also the ovisac in which it lies, and produce the conspicuous wool-like masses on the infected plant. The covering of threads as a whole looks opaque and white: but when highly magnified each thread is seen to be perfectly transparent, colourless, and glass-like; cylindrical, curving, and sometimes with a certain amount of longitudinal striation in the interior of its substance (Pl. 34. fig. 7). The threads vary in thickness; the diameter of cross-section of a rather thick one measured was about 12  $\mu$ . These threads are insoluble in cold wax-dissolving reagents. But Dr. Hopkins, to whom I am much indebted for examining them, states that they are formed of a wax freely soluble in hot reagents. It dissolves in boiling absolute alcohol, and separates on cooling into glistening plates of homogeneous appearance.



These crystals, which melt at 92° C., seem to represent the entire substance, which is practically a pure chemical compound: a mere trace remains in the alcohol from which they separated. The wax is clearly a different kind to that called coccerine, described by C. Liebermann (Berichte der Deutschen chem. Gesell., Bd. xviii. p. 1975), which melted at 106°.

These threads are produced by unicellular glands placed in pairs beneath pits in the integument. Each pit (Pl. 34, figs. 4, 10 *a*, 11, 12, 17) is formed by an invagination of the cuticle, but its walls are thinner than the cuticle covering the surface between the pits (Pl. 34, fig. 17). The area of the cross-section of the pit is about the same throughout. On its floor there are two pore-plates lying close together, so that they appear somewhat like a figure of eight (Pl. 34, fig. 10). The term "pore-plate" is not meant to imply the presence of any perforations in the plate, for I have seen no trace of any such. It is used to indicate a specialised portion of the integument lying over a gland, and through which the secretion of that gland passes to the exterior\*. If there are no perforations in these plates, the very interesting physiological question arises as to the form in which the secretion is produced by the glandular cells, and the manner in which it traverses the chitinous membrane between it and the exterior. Berlese (*l. c.*) considers that in all insects the chitinous integument is uninterrupted by any perforations, so that dermal secretions of all kinds must pass through an extremely thin membrane. Each pore-plate has a broad rim, sloping slightly downwards and inwards, like the surface of a funnel, and more strongly chitinised than the surrounding cuticle; moreover, the rim is transversely striated, and under a high magnification a dark dot is often apparent in the centre of each of the striae. The striae do not appear in sections in any way as pores perforating the rim. The outline of each pore-plate is in the form of an oval flattened at one side, the flattened sides of the two ovals being adjacent, but not quite contiguous. The outer margin of the flattened side of the rim has at its central point a small concavity. The two concavities, being opposite to one another, leave a slightly widened space (Pl. 34, fig. 10, *b*), in which there rise, between the two pore-plates, two minute papillae (Pl. 34, figs. 11 *a*, 12, 17 *b*). These appear to be evaginations of the thin cuticle between the rims; they are in a line at right angles to the long diameter of the pair of pore-plates, and hence when the pair is seen—as it very frequently is—from the side, the two minute papillae appear as a single one (Pl. 34, fig. 11, *a*). However, under a high power, and in some transverse sections, the two can be seen, quite distinct from each other. The space within the rim of each pore-plate is closed by a membrane having an indistinctly dotted or mottled appearance.

These pore-plates are almost invariably in pairs, as described above. In a single case there were seen three of them together, forming a roughly triangular figure. They vary considerably in size, larger and smaller pairs being interspersed over the dorsal surface of the trunk; but the two pore-plates of each individual pair are of equal size. They are exceedingly numerous over the whole dorsal surface of the trunk, where they seem to have no definite orientation, their long diameters lying in all directions. They are extremely conspicuous in preparations of specimens that have been treated with caustic

\* A. Berlese, 'Gli Insetti,' vol. i. p. 492 and footnote.

potash. On the tail they are very scantily distributed, and only the smaller ones are present. On the ventral surface of the insect they are almost absent; there are a few small pairs arranged more or less definitely on each of the segments of the posterior region, and a small pair on each anal lobe.

Under each pore-plate is a single large glandular cell (Pl. 34. fig. 17, *a*), about  $48\ \mu$  across in a direction parallel to the surface of the body. The two cells under each pair of pore-plates lie touching one another, and their contiguous sides are flattened. In transverse sections each pair may thus appear to be a bicellular gland. But each cell has its own pore-plate and secretes its own thread, for two separate threads emerge from each of the pits in the integument (Pl. 34. fig. 14); therefore each pair of cells must be looked upon as consisting of two unicellular glands in close proximity to one another.

The substance of each of these glandular cells is divided into two portions. Immediately under the pore-plate is a small well-defined part, much clearer and less deeply staining than the rest. The remainder of the cell, which contains a large oval nucleus, is much less clear and stains fairly deeply; this part has, in sections stained with hæmatoxylin and orange G, the peculiarity, which it shares with the chitinous cuticle, of taking up the latter stain, whereas its nucleus and the adjacent hypodermal and subhypodermal tissues take up the hæmatoxylin. The arrangement of these pits and glands with respect to the said hypodermis is worth noting. Beneath the hypodermis is a loose layer of subhypodermal cells (Pl. 34. fig. 17, *e*). The hypodermal layer is interrupted by the invagination of the chitinous cuticle to form the walls of the pit, and beneath the floor of the pit is represented only by the two glandular cells. On the other hand, the subhypodermal layer, at the point where it abuts against the walls of the pit, is invaginated so that it forms a loose capsule ensheathing the pair of glandular cells (Pl. 34. fig. 17, *f*).

On the dorsal surface of the tail, beyond the area of the pairs of pore-plates described above, and in the region of the fourth segment, there are two groups of curious structures, one on either side of the middle line. They are pits in the integument, and when seen in side view are like hollow inverted cones with obtuse and rounded apices (Pl. 34. fig. 10, *d*). They vary in shape, size, and arrangement. They are usually, but not always, in pairs; their number varies in different individuals, and is not even always the same in the two groups borne by one individual; usually there are five or six pits in each group. They are more strongly chitinised than the surrounding cuticle. The upper part of their walls looks homogeneous, while the lower or apical portion has a cribriform or sieve-like appearance. However, there do not seem to be any perforations as in a true sieve-plate, but merely thinner and more lightly-staining areas lying in the meshes of a network of thicker substance. It has not been possible to determine whether there are any glands in connection with these remarkable structures, but their appearance suggests that they may be essentially the same as the pore-plates already described, though they differ from them in detail.

There is another widely-distributed kind of cutaneous gland, characterised by the possession of a long, narrow, chitinous duct opening on a level with the general surface of the cuticle (Pl. 34. fig. 15, *a*). The duct is a narrow tube perpendicular to the surface

of the body, and having a straight or almost straight course for some distance. The first part of this straight tube has delicate walls (Pl. 34. fig. 11. *b*), often shrivelled in prepared specimens. The remainder has slightly thicker walls (fig. 11, *c*). At the end of the straight tube there is a very curious sharp bend (Pl. 34. figs. 11 *d*, 16); just on the outer side of the bend the walls of the duct are very slightly invaginated. Beyond the bend the walls of the duct are thinner again, as in the first portion. Immediately beyond the bend the duct is very narrow; it then broadens, and terminates in a slightly swollen end, the cavity of which is increased by numerous minute rounded diverticula, giving to the end the appearance of a morula (Pl. 34. figs. 11 *e*, 15, 16). The portion of the duct from the region of the bend to its termination is buried in the interior of a large glandular cell, measuring about  $34\ \mu$  across. The substance of this cell consists of a well-defined inner clear portion, which stains very faintly, and an outer granular portion, which stains fairly deeply. The granular part is usually very thin, except in one region remote from the point of entry of the duct and containing the nucleus (Pl. 34. fig. 16, *a*). The inner clear part sometimes shows refractive globules (Pl. 34. fig. 16), more frequently striæ radiating from the termination of the duct (Pl. 34. fig. 15, *b*). How far these appearances are artificial it is impossible to say, but it seems probable that the striæ really represent a fibrillar structure of the protoplasm, such as has been described and figured by Prof. A. Berlese\* as existing in the interior or excretory portion of many glandular cells in insects. There is a mass of protoplasm appearing to be of the same consistency as the granular portion of the gland, and containing several rather small nuclei, surrounding the duct at its point of entry into the gland-cell (Pl. 34. fig. 15, *c*). This mass, though in close contact with the gland-cell, is clearly marked off from it; but does not itself, in the sections examined, always show definite division into several small cells, though indications of such division are present. I have endeavoured without success to determine whether these small cells are accessory glandular cells pouring a secretion into the duct at its bend, as might be suspected from the curious conformation of the latter; but there is no evidence that such is the case. The small cells show no special glandular structure and no division whatever into two portions, as do the large unicellular glands. Traces of a loose capsule of subhypodermal tissue can sometimes be seen surrounding the glands and their ducts.

The glands of this kind are numerous over the whole dorsal surface in the spaces between the pits of the thread-producing glands, their ducts being shown in fig. 10, *f* (Pl. 34). They are also numerous over areas where the thread-producing glands are almost entirely absent, that is, on the dorsal surface of the tail and the ventral surface of the trunk. They are more sparingly distributed on the ventral surface of the tail. No excretory products have been seen in connection with their orifices, so that it is not possible to state what part they play in the life-history of the insect.

A third kind of cutaneous glands must be noticed. They are much more localised in their distribution than the preceding, and are confined to the ventral surface. Their pore-plates lie in seven transverse bands in the posterior region of the body, near the

\* 'Gli Insetti,' vol. i. p. 498 & fig. 559.



hind margins of the segments. The most anterior band is ill-defined, and its pore-plates few. The next four bands are well-defined and continuous, consisting of two or three irregular rows of pore-plates. The next band (Pl. 34. fig. 9, *e*)—at the posterior margin of the sixth segment—resembles these, but is interrupted in the middle line by the genital aperture (Pl. 34. fig. 9, *d*). The band on the seventh segment merely consists of a small group of pore-plates on either side of the middle line; a few pore-plates are also present on the terminal segment. On the more anterior part of the body these pore-plates are only present in small groups just external to each spiracle and antenna.

These pore-plates have a distinct form of their own. As usual, they are more strongly chitinised than the surrounding cuticle. They are not arranged in pairs. Each (Pl. 34. fig. 13, also fig. 9) is circular, with a broad rim, immediately within which is a circle of dots. The space within these stains more deeply than the rest, but has a rather indistinct central dot of more lightly-staining substance. The glands in connection with these plates lie immediately below the chitinous derma. They are somewhat elongated, narrower in the portion nearer the derma, and much smaller than any previously described; those in the posterior region of the body measure about  $18\ \mu$  in a direction perpendicular to the body-surface. I cannot be quite certain whether those in the posterior region consist of one or more cells. In connection with each spiracular group of pore-plates there can be seen a number of closely-packed, elongated, somewhat pear-shaped cells, each with a distinct nucleus.

Judging from analogy with allied forms, which fill their stigmatic grooves with wax\*, the position of some of the glands of the third kind with respect to the spiracles might suggest that they may have this function. Moreover, on the inner surface of some of the ovisacs can be seen four patches of white amorphous substance, corresponding roughly with the positions where the spiracles would lie when the female was in the ovisac; but, though extremely probable, it is not certain that the amorphous substance is wax. In connection with this, it may be mentioned that Berlese †, in describing certain species of *Lecanium*, figures plates which are like the pore-plates described above, and which are found in the stigmatic grooves and belong to glands that secrete wax into these grooves.

*Ovisac* (Pl. 34. fig. 5).—The white mass of threads arising from the dorsal surface conceals not only the insect, but also the curious ovisac in which it lies. The ovisacs are fixed to the twigs, for in the material examined the insects are always attached to the woody stems, and not to the small leaves, of the plant. In the great majority of specimens the ovisac has the form of a widely-open cup or basket; opaque, brownish-yellow, with smooth inner surface, and the outer surface rough and bearing a number of white threads similar to those arising from the dorsal surface of the insect. It is closely adapted to the shape of the creature's body, and there is a deep impression in the margin at one point, and sometimes a slight spout-like prolongation, in which the tail of the

\* A. Berlese, 'Le Cocciniglio Italiano,' pt. ii. pp. 132, 133 & 182, 183 [ex Riv. Pat. Veg. vol. iii. No. 1-8]; Newstead, 'Monograph of British Coccidæ,' vol. i. p. 15.

† 'Le Cocciniglie Italiane,' pt. ii. tav. 5. fig. 2 a.

insect lies extended. Under the microscope there can be seen in the walls a structure consisting, not of interlacing threads, but of branches anastomosing in all directions (Pl. 34, fig. 6, *a*). They are colourless, transparent, and glassy in appearance, and very minute, their thickness being less than half that of the white threads covering the insect's body. The skeleton that they form is best seen in the margin of the cup; in the rest of the walls it is covered with opaque material (Pl. 34, fig. 6, *b*) of brownish and yellowish colour, with felted masses of threads, and with some of the larger white threads so characteristic of the insect. In the denser portions the substance of the ovisac has to some extent a radiate arrangement; irregular thicker parts run from the base towards the margin of the cup, and alternate with thinner and more translucent portions. The ovisac, like the white threads, will not dissolve in cold chloroform, xylol, or ether. The mode of its formation cannot be made out in the preserved material.

Such is the structure in the great majority of specimens. But in a very few of the dried specimens the ovisac has proved to be completely closed except for an opening on the somewhat spout-like prolongation corresponding to the tail of the insect. As mentioned above, in the open cups there is a depression in the wall to accommodate the tail, and in one case this depression was just arched over, so that it formed a round hole (Pl. 34, fig. 5, *a*). This is probably an intermediate stage between the open depression and the closed prolongation containing the tail. It appears as if, at a later stage in the life-history than that attained by most of these specimens, more secretory material is added to the open cup, so that the latter becomes a closed structure, completely shutting in the female, as is the case in the allied genus *Asterolecanium* \*. One of these closed structures was empty, the other contained a much shrivelled female. This latter one bore on its outer surface a number of the white threads, but they formed a mass much smaller than that of the threads covering the females seated in open cups.

In several of the specimens preserved in formalin, each of the tubercles of the dorsal longitudinal rows bears a small plate or flake of glass-like secretion, insoluble in cold wax-dissolving reagents. Each of these flakes is attached at its central part to the surface of the tubercle, and has in its peripheral portions exact impressions of the pairs of pore-plates of the circumjacent integument. Through some of these impressions rise the threads secreted from the pore-plates beneath. The whole appearance suggests that the secretion has been poured out from glands on the tubercle, has flowed in all directions from this central point, surrounding the bases of the threads emerging from the pits, and has hardened into the transparent flake, receiving in the process impressions of the pits and pore-plates of the integument. It is possible that, by further excretion, the separate flakes on the tubercles may grow in extent till they unite and form a single complete covering to the dorsal surface, continuous at the sides with the margins of the cup-like ovisac, thereby transforming the latter into a closed structure. But there is no proof that such is the case.

*Male Puparium* (Pl. 34, fig. 8).—The puparia are attached to the woody stems of the *Helianthemum*. Each is about  $1\frac{2}{3}$  mm. long, much smaller than the ovisac, elongate-

\* Newstead, 'Monograph of British Coccidæ,' vol. ii. p. 150.



ovate, narrowed posteriorly, quite opaque, white or very pale greenish, thus differing in colour from the ovisac. The inner surface of the walls is smooth, the outer surface rough. Externally there are a number of white threads similar to those secreted by the female; they are more numerous near the anterior end. Their presence in this structure formed by the male is interesting. The microscopic composition of the puparium is much like that of the felted parts of the ovisac, but there is no disposition into more opaque and more translucent portions. The puparia are empty, each having a neat, transverse slit at the posterior end, where the male has emerged (Pl. 34, fig. 8, a).

The mycelium of an Ascomycete fungus is found ramifying in the walls of some of the puparia and ovisacs, and outside the bases of some of the latter. The dark masses of spores formed in the mycelium appear as sooty-looking specks. Within one of the closed ovisacs mentioned above were a number of dried and empty perithecia of the fungus. Mr. R. H. Biffen, who has kindly examined the fungus, states that, although he has found no ascospores, the form of the perithecia and spore-masses in the mycelium are strongly conclusive of its being a species of *Capnodium*. Newstead\* states that the honey-dew secreted by British Coccids is almost invariably attacked, shortly after deposition, by a fungus of the genus *Meliola*. This is allied to *Capnodium*. Berlese† also speaks of fungi habitually accompanying Coccids on plants. It is therefore probable that the fungus in question nourishes itself on certain excretory products of the Algerian Coccid.

It should be mentioned that a single dried-up female specimen was found entangled in the mass of threads belonging to another individual, and that it contained within its shrivelled integument a number of oblong-ovoid bodies, also in a desiccated condition. The specimen was one of those preserved in formalin, and must therefore have been dead and desiccated at the time when the infected plant was found. Its condition unfortunately makes it impossible to ascertain the nature of the ovoid bodies which it contains.

*Cercococcus eremobius* was found in the desert, on a plant which is essentially a desert-plant. The greatest peculiarity about the insect is the thick covering of white threads, corresponding to which is the large development of cutaneous glands. An analogy is suggested between this character and that of those numerous desert-plants which are clothed with hairs, which serve them in good stead by preventing excessive loss of moisture; and it is possible that the covering of threads may benefit the insect in the same manner that the hairs benefit the plants. It may be emphasised again that they can hardly serve any purpose of protective similarity to surroundings, since they form conspicuous white masses on the twigs. Since the locality where the creature was found is by no means inaccessible, it is to be hoped that before long fresh supplies of material will be obtained, including both sexes and all stages, so that the whole life-history of this interesting insect can be elucidated.

\* 'Monograph of British Coccidæ,' Ray Soc. vol. i. p. 19.

† A. Berlese, 'Le Cocciniglie Italiane,' pt. i. p. 43 [ex Riv. Pat. Veg. vol. ii. No. 1-8].

## EXPLANATION OF PLATE 34.

- Fig. 1. The specimen of *Helianthemum kahiricum* bearing *Cercococcus eremobius*. Nearly two-thirds natural size.
- Fig. 2. Ventral view of adult female. *a*, outer, *b*, inner longitudinal furrow of the right side; *c*, antenna; *d*, anterior spiracle.
- Fig. 3. Antenna in side view, showing the spine and two of the hairs.
- Fig. 4. Dorsal view of adult female. *a, a*, tubercles of the median and lateral longitudinal rows. The dots represent the numerous pits of the thread-producing glands.
- Fig. 5. Ovisac on a twig. *a*, hole in which the tail of the insect lay.
- Fig. 6. Portion of the wall of the ovisac, highly magnified. *a*, anastomosing branches; *b*, opaque material.
- Fig. 7. Part of one of the threads secreted from the dorsal surface, showing the longitudinally striated appearance. To same scale as fig. 6.
- Fig. 8. Male puparium on a twig. *a*, slit at posterior end.
- Fig. 9. Ventral view of extremity of tail of adult female, showing the anal ring and orifice. *a*, minute papillæ on the integument; *b*, median lobe, dorsal to the anus; *c*, one of the anal lobes; *d*, genital aperture; *e*, transverse band of circular pore-plates on the sixth segment.
- Fig. 10. Portion of the dorsal integument of a specimen treated with caustic potash, highly magnified. In the upper part are some of the numerous pairs of pore-plates. *a*, outline of floor of one of the pits; *b*, space left between the two concavities in the margins of the rims; *c*, commencement of the tail-region, where the pore-plate pairs are almost completely absent. In the lower part of the figure are some of the pits with sieve-like walls; *d*, pit in side view; *e*, one in surface view; *f*, narrow ducts of glands of the second kind.
- Fig. 11. Two of the dorsal pits in side view, each with a pair of pore-plates at the bottom; *a*, papillæ between the pore-plates. In the middle, a duct of a gland of the second kind; *b*, thin-walled portion of straight tube; *c*, its thicker-walled portion; *d*, bend in the duct; *e*, terminal swelling.
- Fig. 12. One of the dorsal pits and pairs of pore-plates, from a transverse section torn in such a way as to show the pair of papillæ between the pore-plates.
- Fig. 13. A single circular pore-plate from one of the transverse ventral bands. To same scale as fig. 10.
- Fig. 14. Part of the dorsal surface of a dried specimen, showing some of the pits, each with two threads emerging from it; the greater part of the threads cut away.
- Fig. 15. One of the glands of the second kind. *a*, aperture of duct on outer surface of body; *b*, inner secretory portion of gland-cell showing radial striæ; *c*, accessory cells.
- Fig. 16. Part of one of the same glands, more highly magnified. *a*, nucleus of glandular cell.
- Fig. 17. Transverse section through one of the pairs of thread-producing cells. The section only passes through the nucleus of one gland. *a*, one of the cells; *b*, papilla between the two pore-plates; *c*, cuticle of the general body-surface; *d*, hypodermis; *e*, subhypodermal layer, and *f*, the sheath which it forms round the glands.